PHYSIOLOGY.

Vasomotor Nerves of the Portal Vein.—Mall[1] makes an important advance by finding experimental evidence of the existence of vasomotor nerves in the portal vein. This strengthens the idea that this vein and its branches play the rôle of arteries with reference to the capillaries of the liver. If the flow of blood from the aorta to the alimentary canal be stopped, and the splanchnic nerve be stimulated, a narrowing of the portal vein may be detected. If the stimulation be continued, the lumen entirely disappears; at the same time there is an increase in arterial pressure. The subject is to be investigated more fully.

Relation between Molecular Weight, Molecular Structure, and Physiological Action.—Recent work of Gürber[2] on the physiological action of lupetidine and related substances has led Gaule[3] to the conclusion that it is not the weight or size of the molecule that determines the physiological action, but the latter is the product of the effects of the different components of the molecule. If, then, a gradual increase in molecular weight be brought about by the continued addition of a CH_3 group, for example, similarly placed in the molecule, the physiological effects of the compounds so produced will be similar, varying only in degree; but if an NH_2 group be added instead of a CH_3 group, the increase in molecular weight will be essentially the same, but the physiological effects will be different. Thus the physiological effects of drugs will vary with the molecular weight, only when the variation in the latter results from an increase or decrease in the number of identical atomic groups. A second point established by Gürber's work is that different groups of atoms act differently, and that these different groups act on different sets of organs. This would suggest the idea that the living substance in each system of organs represents a peculiar chemical proportion; certain groups of atoms in the body immediately entering into combination with certain groups of atoms in the molecules of substances taken in.—L. G.

Life-History of Blood Corpuscles.—A valuable addition to the literature of the blood corpuscles has appeared recently in the

[1] Archiv für Anatomie und Physiologie. Phys. Abth., Suppl. Bd., 1890.

[2] Archiv f. Anat. u. Phys. Physiol Abthlg., 1890, p. 401.

[3] Ibid., p. 478.

form of a careful paper by Dr. W. H. Howell,[4] of Michigan University. As a result of work extending over a period of two years, most of which was confined to the cat, the author concludes that the corpuscles originate not, as is usually assumed, in different ways, but in accordance with one scheme of reproduction, which is essentially the same in health as in disease, in the embryo as in the adult.

As regards the red corpuscles, these arise in the very young embryo from cords of mesoblastic cells, which outline the position of future veins; the central cells of the cord form corpuscles, while the peripheral ones form the walls of the veins. Such developing blood vessels were found in the liver and in the muscular tissue of the posterior limb, and it seems probable that corpuscles are thus formed wherever there are developing blood vessels. In the second half of embryonic life red corpuscles are formed in the liver, the spleen, and the red marrow. At first this function is most active in the liver, next in the spleen, and lastly in the red marrow. A few weeks after birth, in the cat, the liver and spleen cease to take part in their formation, and in the adult healthy animal they are produced in the red marrow alone. In case of extreme anæmia, resulting from bleeding or whatever cause, the spleen may resume its embryonic function. Wherever and whenever red corpuscles are produced, nucleated forms precede the mature non-nucleated forms, the latter being derived from the former by the *extrusion or migration of the nucleus*,—a process which the author was able to follow in part in the living cell. The life-history of the corpuscle was studied most fully in preparations from the marrow, and is given in brief below. In the very young embryo two forms of red corpuscles occur. One is very large, oval, and always nucleated, which the author regards as possibly an ancestral form. These disappear in early embryonic life. The other, the true mammalian corpuscle, is much smaller, circular in outline, and is found both nucleated and non-nucleated. These apparently arise from colorless, spherical cells —erythroblasts—found in the marrow and elsewhere. The marrow erythroblasts are derived from large embryonic cells, known in the adult simply as marrow-cells,—the unchanged descendants apparently of the original mesoblastic cells from which the marrow is formed. These embryonic marrow-cells multiply by karyokinesis, the daughter cells sooner or later acquiring the structure of the erythroblasts. The erythroblasts multiply rapidly by karyokinesis, giving rise ultimately to cells from which the nucleated red blood corpuscles are derived by the development of hæmoglobin within the cell substance. These

[4] *Journal of Morphology*, Vol. IV., p. 57. 1890.

nucleated red corpuscles multiply also by karyokinesis. When mature they are converted into the ordinary non-nucleated forms by the extrusion of the nucleus. The extruded nuclei are dissolved in the blood plasma, and there is evidence to show that they take part in the formation of fibrinogen. Owing to the loss of the nucleus the corpuscle assumes the biconcave form seen in circulating blood.

The white corpuscles, or leucocytes, arise from the lymphocytes, which are formed in the lymphoid tissue, especially the lymphatic glands. The leucocytes enter the blood apparently as unchanged lymphocytes. Each possesses a single vesicular nucleus, surrounded by a small protoplasmic envelope, and has not the power of making amœboid movements. From this stage the cell develops by growth into a second stage, characterized by a large protoplasmic envelope and amœboid movements. In the third stage the nucleus is drawn out into an elongated strap shape, and may become horseshoe shaped or coiled into a spiral. This cell is actively amœboid, and by the fragmentation of its nucleus becomes converted into the multinucleated leucocyte of the blood. This latter is not, as was formerly thought, a cell in process of division, but rather a disintegrating form, the fragmentation of the nucleus being the first step in the process. The author believes that the fragmented nuclei persist for a time as the blood plates. He is led to this conclusion both by an examination of the leucocytes when in the act of disintegrating, and by the similarity in the appearance and manner of staining of the fragmented nuclei and the blood plates. The disintegrated leucocytes are dissolved in the plasma to form the paraglobulin, which is believed to be derived wholly from this source.

The author discusses fully the work of others and his work has been already reviewed by Minot in the AMERICAN NATURALIST. In addition to the results of actual observation the paper contains a number of interesting suggestions. The most potent of these, perhaps, is the view as to how we may best attack the dark problems concerning the origin and relationship of the blood proteids, and the part which they play in the general metabolism.—E. COOKE.